The reACT$_2$ant

Summer 2009

Volume 16 Issue #3

I hope you are having a good summer. I just got back from Charleston, South Carolina and learned that the slaves used a mortar and pestle to prepare the rice crop for market. First the rice is pounded with the flat end of the pestle to remove the husk and then the rice is pounded with a pointed end of the pestle to remove the bran. Between each pounding the rice is winnowed in baskets. Be sure to look for science on your vacation and let me know what you find.

Last summer I attended the Material Science Camp at Michigan Tech and learned how to enamel copper and anodize titanium (purchased from Reactive Metals). I did these activities with my AP chemistry students after the AP test and it was a blast.

To anodize Ti, all you need is four 9 Volt battery and a solution of borax. The color that appears on the Ti piece depends on the voltage applied. Check out the chapter on Titanium in technicolor at http://graysci.com/

For the enameling I bought the enamels from Thompson Enamel and a product called Kly-fire. I used a map gas torch to heat the copper and enamel powder so firing took about 2 minutes.

I invited the AP art teacher bring her AP students learn how to enamel. What a difference the final products were for the chemistry students verses the art students. Chemistry students just do it and the art students made the piece look stunning with swirls, abstract trees, and works similar to Pieter Mondriaan. It was a great experience and one that will be repeated next year.

It is important for chemistry teachers to find ways that science is relevant to the students we teach. Try humor: Why won't the US accept the metric system? Because we don't accept foreign rulers.

This summer I will attend POGIL training in Salt Lake and ChemEd 09 in Virginia. I hope to share what I learn in the newsletter as well as with my students. Meg

Inside this Issue:

CAST Scholarships:
Check out the ACT2 webpage for 10 CAST 2009 Scholarships to be given to teachers in need.
Nominate a fellow teacher for the Teacher of the Year Award.
Look for "The Spirit of ACT2" award form in honor of Rosendo Garcia.
Be sure to keep your email address current with Bob Casao so the science updates and news comes to you.

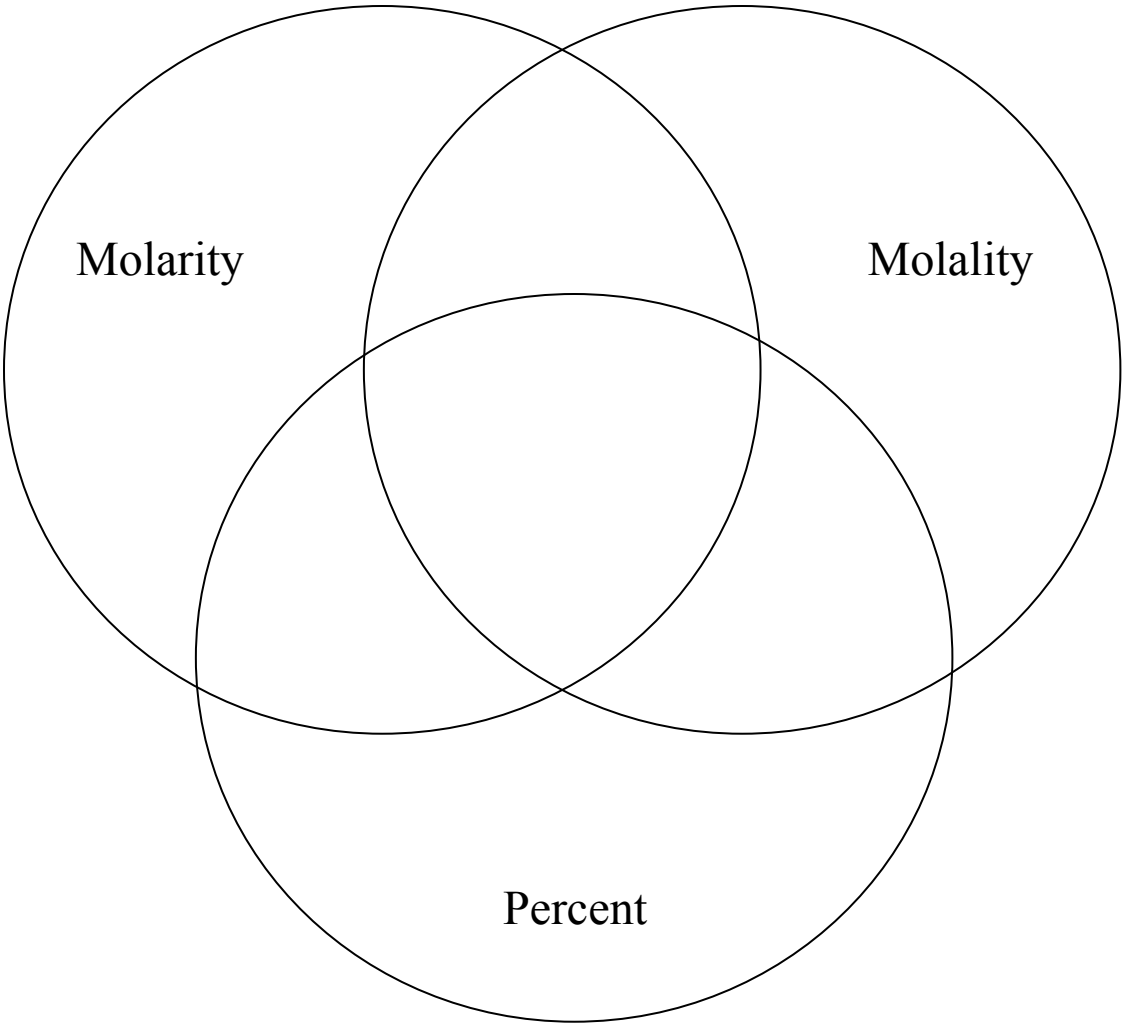
BCCE 2010 will be at the University of North Texas on August 1-5, 2010.
Webpage:http://bcce2010.org

The 2010 ACT2 Biennial is currently scheduled for June 28 - July 1 in Katy, Texas. More to come later.

Executive Board 2008-2010

Warm Up on Solutions

From Amiee Modic



Use the terms, symbols and phrases listed below to complete the Venn diagram comparing Molarity, Molality, and Percent.

Moles of solute
Amount of solution
M
Concentration
mass or volume
Predicts solution properties
Mass of solvent
Liters
m
Diluting stock solutions
Rubbing alcohol

21st BCCE: A New Decade for Opportunity

UNT in Denton will host another major ChemEd event in 2010. The 21st Biennial Conference on Chemical Education (BCCE) will be held at UNT, Denton, August 1-5, 2010. The CaNe Roundup is the largest chemical education conference in the world. Over 1500 participants are expected to share the latest and the greatest on teaching chemistry!

The traditional program contains a wide variety of plenary speakers, keynote speakers, workshops, presentations, demonstrations, exhibits, and posters, each of which is designed to provide new ideas, strategies, and techniques for involving students in active learning. The typical technical program features plenary and keynote speakers, more than 800 presentations in over 100 sessions, and over 50 workshops. Among the various symposia are discussions of chemistry laboratory work; green chemistry; chemistry education and nanotechnology; computation, modeling, and molecular visualization across the chemistry curriculum; cooking with chemistry; links between chemistry, engineering, and physics education; teaching first-year chemistry, biochemistry, and inorganic, organic, and physical chemistry; assessment; teaching-assistant training; research in chemical education; the George R. Hague Jr. Memorial AP/IB chemistry symposium (George was a high school chemistry teacher in Dallas for many years); teaching to the national science standards; peer-led team learning (PLTL) and process-oriented guided-inquiry learning presentations (POGIL); and other special symposia. There is also an exposition that typically attracts at least 50 commercial and academic entities.

Several prestigious social events including the opening ceremonies with UNT renowned 1 o'Clock Lab Band, a large BBQ at the Circle R in Flower Mound featuring the Crawfish Band (UNT's Starman, Ron Dilulio, lead singer), armadillo races, and the palomino dance team, Cowgirl Chicks, a watermelon fest with seed spitting contest, an ice cream social sponsored by *the Journal of Chemical Education* and 2YC3, and a opportunity to raise a little $_{20}Ca_{10}Ne$ with the Al D. Hyde and Key Tones leading to the closing ceremonies on Thursday. One of our invited guests is the infamous Chief Medical Examiner of Tarrant, Denton, and Parker Counties, Dr. Nizam Peerwani.

If you missed the ChemEd 07 field trips, we're going to have several of the same ones. We're going to go back to the Glen Rose Nuclear Facility at Comanche Peak, Brushey Creek Vineyards, Billy Bob's, and the Printing and Engraving Facility in Ft. Worth. There will also be the Denton Horse Country Tour and a Mole Day Breakfast and Fun Run. Don't forget we will also invite many of the same exhibitors as we had for ChemEd 07 to participate. The best publishers in the country and best academic supply houses will be open for business on Sunday night – Tuesday noon.

We know how to throw a pachanga, so come on down and be part of the $_{20}Ca_{10}Ne$ Roundup! Come early, stay late, and be ready to do CHEMISTRY! Live Green at the home of the Mean Green!

Diana Mason, chair

CAST 2009—GALVESTON

Come join us in Galveston, Texas for CAST 2009! November 5-7,2009

Luncheon Speaker: Paul Price
Great door prizes and freebies.

Chemistry Strand:

Rhonda Alexander:	**E is for Engage**
	E is for Explore
Dianne Aparicio:	**A Blueprint Lab**
Meg Young:	**Consumer Chemistry**
Kerri Boyd	**Halloween Chemistry Demo Show**
Sharon Williams	**Molecular Motivation**
Vinay Dulip	**A Demo A Week Classes Peak**
Roxie Allen	**25 Years of Chemistry, That's Crazy!**

Chemistry Short Course:

New to Chemistry? Learn from Master Teachers
Amiee Modic & Friends

Answers to Super Mug Contest
1. How many mugs by CAST 2008? 18
2. First mug: L. O. (Tom) Morgan; Am
3. Greatest number of elements discovered: Ghiorso
4. Nobel Laureates: 5
5. How many mugs feature oxygen? 3
6. Es mug had to be re-typeset because the first version printed: E = mc2!
7. How many mugs feature carbon? 3
8. What is the highest atomic number on a mug? 110
9. How many signatures were from living scientists when obtained? 6
10. How many mugs don't feature at least one element? 2

Tiebreaker:
Here's a list of all the signatures in order.

1. Morgan	8. Priestley	15. Segre
2. Seaborg	9. Ghiorso	16. Scheele
3. Smalley	10. Choppin	17. Kelvin
4. Curl	11. Avogadro	18. Marignac
5. Lavoisier	12. Dalton	19. CAST 09
6. Davy	13. Curie	
7. Mendeleev	14. Einstein	

Pat Funk, Jane Smith, David Katz, Melissa Jones, Bette Bridges, Adele Mouakad, Kathleen Holley, Trey Seastrunk

Add the liquid nitrogen slowly so that the ice cream mix does not freeze too rapidly. To get the best flavour, you want to have bubbles of gas in the ice cream. Slow mixing and freezing allows this to happen. Use a pan with a handle to hold onto when stirring the liquid nitrogen into the ice cream mixture.

The following recipe is the ice cream mix recipe that George Hague would use for his liquid nitrogen ice cream.

1) Into a large bowl (a clear plastic bowl will enable your audience to see what is going on inside), add equal parts of half- and-half (1 quart) and heavy whipping cream (1 quart).
2)Mix together.
3)Add one cup granulated sugar.
4)Add the equivalent of 3-4 artificial eggs to the mix.
*5)*Add *4-5* teaspoons of vanilla extract.
6)Mix well with a whisk to dissolve all ingredients, particularly the sugar.
7)Add 16 ounces of preserves (not jelly) and whisk the mixture thoroughly for 2-3 minutes. (Optional)

Concepts You Can Teach With Ice Cream

To answer why a teacher would include the making of ice cream in the classroom, the following is a list of some topics that can be taught by making ice cream.

1. Freezing Point Depression → Colligative Properties
2. Measurement [measuring volume, mass, temperature]
3. Heat Transfer
4. Materials, substance, mixture, solutions
5. Cold, cyrogenics

Matter is classified as pure (substances) and impure (mixtures). The substances are divided into elements made up of only one type of atom, and compounds made up of aggregates of more than one type of atom. Impure matter, mixtures have many more classifications

The making of the ice cream itself allows the students to study a section of matter often neglected in our courses, ***colloids***. The cream and milk will not normally mix. The cream is mainly a fat or oil which is non-polar, while the milk is mostly water which is polar. The cream on water gives two phases, which makes it a heterogenous mixture. The milk and cream themselves are colloids. They look homogeneous, but are impure and as liquids not transparent. Very finely divided solids are suspended in the liquid which block or scatter the light. The suspended particles are larger than ionic or molecular size to be able to do this.

Have students float a vegetable oil on water to see the effect. The two liquids are immiscible, that is they will not mix. Now add some soap or detergent to the oil on water and mix the three materials. The soap has both a polar and non-polar end that links the oil and water so they mix. The mixture is not transparent like a solution, but cloudy. This makes a colloid called an emulsion. We would not want to add detergent or soap to emulsify the cream and milk in ice cream, so the emulsifying agent added is egg. The proteins in the egg have both polar and non-polar areas that hold the cream and milk together.

Lewis Structures and Mathtype

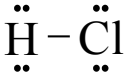
http://tcmtechnologyblog.blogspot.com/2008/03/lewis-dot-diagrams-in-mathtype.html
Check out this website and short video on how to use mathtype. Ask your math department if they have a site license for the program.

New TEKS: 6e. express the arrangement of electrons in atoms though electron configurations and Lewis valence electron dot structures.

Lewis Structure Word Scramble

Choose the correct answer for each question below, and record the letter of that answer at the end of the puzzle. Unscramble the letters to determine the two word term related to writing Lewis structures. The answers to questions 1-5 will be used to form the first word of the two word answer while the answers to question 6-9 will form the second word.

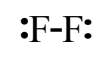
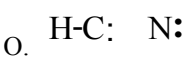
1. Which of the following is the correct Lewis structure for hydrochloric acid?

A.  B.  C. 

2. Which of the following contains one lone pair of electrons?

S. HBr T. NH_3 U. O_2

3. Which of the following molecules is the correct Lewis structure?

M.  N.  O. 

4. Which molecule contains a double bond?

R. HCl S. H_2S T. SiO_2

5. Which one of the following molecules contains the most lone pair electrons?

D. HF E. CF_4 F. PH_3

6. Which of the following contains only single bonds?

L. CCl_4 M. C_2H_2 N. CO_2

7. Which one of the following molecules contains two lone pairs of electrons on the central atom?

E. H_2O F. $AsCl_3$ G. SiH_4

8. Which central atom has no unpaired electrons?

S. AsF_3 T. NF_3 U. CH_4

9. Which of the following molecules contains a triple bond?

P. H_2 Q. F_2 R. N_2

Letters in the first word: _____ ____ ____ ____ _____

Letters in the second word: _____ _____ _____ _____

Answer: OCTET RULE

6d. Use isotopic composition to calculate average atomic mass of an element.

Atomic Mass Problems

The object of this exercise is to develop the ability of working atomic mass problems. Express all answers to **two decimal places**. Show all work and include any units.

Example: There are two naturally occurring isotopes of silver: Ag-107 and Ag-109. The relative abundance of Ag-107 is 51.84% and Ag-109 is 46.16%. Find average atomic mass. Change % to regular number then multiply by the mass and add the numbers together to find the weighed average. (0.5184 x 107) + (0.4816 x 109) = 107.96 amu

_____ 1. There are two naturally occurring isotopes of Boron: Boron-10 and Boron -11. If the relative abundance of Boron-10 is 19.91% and boron-11 is 80.09%, what is the average atomic mass of Boron?

_____ 2. There are two naturally occurring isotopes of Chlorine: Chlorine-35 and Chlorine-37. If the relative abundance of Chlorine-35 is 75.78% and Chlorine-37 is 24.22%, what is the average atomic mass of Chlorine?

_____ 3. There are two naturally occurring isotopes of Copper: Copper-63 and Copper-65. If the relative abundance of Copper-63 is 69.17% and Copper-65 is 30.83%, what is the atomic mass of Copper?

_____ 4. There are two naturally occurring isotopes of Gallium: Gallium-69 and Gallium-71. If the relative abundance of Gallium-69 is 60.11% and Gallium-71 is 39.89%, what is the atomic mass of Gallium?

_____ 5. Rhenium exists as two naturally occurring isotope: 37.4% Re-185 and 62.6% Re-187. Find the average atomic mass.

_____ 6. There are two naturally occurring isotopes of Antimony. If the relative abundance of Sb-121 is 57.21 and Sb-123 is 42.79, what is the average atomic mass?

_____7. Rubidium is found with the following composition: 72.17% Rb-85 and 27.83% Rb-87. Find the average atomic mass.

_____ 8. Find the average atomic mass if there is 37.3% Ir-191 and 62.7% Ir-193.

_____9. Magnesium is found with the following composition: 78.9% Mg-24, 10.00% Mg-25, and 11.01 % Mg-26. What is the average atomic mass?

_____10. Silicon exists in nature as three isotopes: 92.23% silicon-28, 4.68% silicon-29, and 3.09% silicon-30.

_____ 11. Zinc exists in nature as five isotopes. Zn-64 occurs 48.63%, Zn-66 occurs 27.90%, Zn-67 occurs 4.10%, Zn-68 occurs 18.75% and Zn-70 occurs 0.62%. What is the atomic mass of Zinc?

11(B) understand the law of conservation of energy and the processes of heat transfer;

Heat Capacity and the *Titanic*

from Suzanne Stoltz and Janet Dickinson

Purpose:
To introduce calorimetry through a discussion of hypothermia

Materials:
class set of small beakers or cups with room-temperature tap water
CD of music from the movie *Titanic*
DVD of the movie *Titanic* (optional)

Procedure:
1. As students enter the classroom, play the theme from the movie Titanic.
2. Direct the students to each pick up a small beaker of room-temperature tap water.
3. When class begins, play the video segment from the movie Titanic that depicts the rescue of the character Rose.
4. Discuss the cause of death of the passengers with the students by posing the following questions:
   Did the passengers drown? *No*
   What caused their death? *hypothermia*
   What is hypothermia? *significant drop in body temperature*
   Why didn't Rose die? *she was not in the water*
5. Direct each student first to hold the index finger in the air and then to immerse the finger in the room-temperature water.
   Ask for observations. *The finger feels cool in the water.*
   Why does the finger feel cool? *Body temperature is warmer than room temp.*

Discussion

Air has a fairly low density (0.0012 g/mL at 25 ºC and 1 atm) and a relatively low specific heat capacity of 1.01 J/g ºC. Little of our body heat is lost in warming the air around us. Water, however, has a density of approximately 1 g/mL and a specific heat capacity of 4.18 J/g ºC. As a result, when our finger is in contact with a greater mass of water, it loses a significant amount of heat. Cells in our body have a high water content, so we are able to resist temperature changes. (A discussion of temperature-protective features of the body such as perspiration, shivering, vasoconstriction and dilation, and subcutaneous fat can be interjected here.) However, once the body temperature has been significantly lowered, raising it back requires a significant amount of energy from an external heat source. Metabolism cannot raise the body temperature because the rate of metabolism has already been slowed due to the lower temperature.

References

Banks, P., "Hypothermia – Surviving the Big Chill," *Chem Matters*, December 2001, pp 14-15.
Kimbrough, D., *J. Chem Educ*. **1998**, 75, 48.
Flinn Scientific Foundation

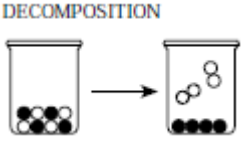
Use magnets glued to the back of laminated cards with any terms you want students to sort or match. This way you can make an activity the whole class can observe and/or participate in. If there is a concept map you want the students to build, reproduce the words on cards and have the students make the concept map as a class. Glue magnets on the backs of pictures that illustrate any cycle (water, food chain, life). Example:

Property	Unit	Tool
volume	milliliter liter	graduated cylinder
capacity	cubic centimeter	
length	meter kilometer	ruler
width	centimeter	meter stick
height	millimeter	
mass	gram kilogram	balance

Physical or Chemical Change? Sort the following words into correct group.

Baking a cake
Breaking a glass
Burning a candle
Digesting food
Frying eggs
Lighting a match
Making Kool-Aid
Molding clay
Rusting iron
Subliming dry ice
Oxidizing aluminum
Freezing icee pops
Boiling water
Burning wood
Crushing a can
Diluting a solution
Shredding paper
Magnetizing an iron pin
Melting butter
Coloring hair
Grinding pepper
Souring of milk
Tarnishing of silver
Combusting gasoline

To model the particle nature of matter:
Glue brightly colored pompoms onto the magnets and model molecules, chemical reactions, crystal structures, states of matter, stoichiometry, etc.



EASY ELECTROLYSIS of H_2O

From Babara Schumann

Some oxidation-reduction reactions do not occur spontaneously. They can be driven by electric energy. An electrolytic cell changes electrical energy into chemical energy by forcing a reaction to take place that would not take place otherwise. This process is called electrolysis. The electrolytic cell is made-up of a pair of electrodes, an electrolytic solution, a container, and a 9 volt battery. One electrode is connected to the negative terminal and has a negative charge and one is connected to the positive terminal and has a positive charge. The transfer of electric charge in the cell is called ion migration. Positively charged ions migrate toward the negative pole and negatively charged ions migrate toward the positive pole.

In the electrolytic cell the reduction occurs at the negative electrode that is called the cathode. Oxidation occurs at the positive electrode that is called the anode. These reactions at the electrodes complete the electric circuit and allows electric energy to be transferred from the battery to the electrolytic cell. During the electrolysis of H_2O, the following reactions occur:

$2H_2O\ (\ell) + 2\ e^- \rightarrow H_2(g) + 2OH^-\ (aq)$ Negative terminal

$2H_2O\ (\ell) \rightarrow O_2(g) + 4H^+\ (aq) + 4e^-$ Positive terminal

Materials:
9 volt battery that has been dipped in canning wax numerous times clean the wax off terminals
0.1 M Na_2SO_4 solution with Bromothymol Blue indicator to produce a green color
600 mL Beaker or a 2L bottle with flat bottom
2 small test tubes (75 x 100mm)

Procedure:
1. Fill the beaker about 3/4 full with Na_2SO_4 solution.
2. Take small test tubes and fill with solution in beaker.
3. Set the wax coated 9 volt battery on bottom of the beaker containing the solution. Carefully move test tubes into an upside down vertical position over battery terminals without losing liquid. Note which test tube is over which terminal.
4. Allow some metal of terminal to be exposed. Observe and record the color and the water level in each test tube. Can you tell which gas was collected in each tube? How do the coefficients of the gases compare with the volumes of the gases produced. Now place a finger over the end of each tube and lift out. Remove the battery and rinse with water. Return the solution to the used Na_2SO_4 container to be recycled.

Notes: This demonstration can be used to show chemical changes, a decomposition reaction, oxidation reduction reaction, how gases are produced.

MOLE DAY ANALOGIES

MOLE DAY THEME 2009: MOLAR EXPRESS

To help students understand that the mole is a counting number, compare a mole to these everyday items:

- a dozen eggs (12)
- a deck of cards (52)
- a gross (144 or 12 dozen)
- a score (20)
- a ream of paper (500)
- a mole of sugar (6.02×10^{23} molecules)

1 mole of marbles will cover the earth to a depth of 50 miles.

If you count at a rate of a marble per sec, it would take over 4 million years to count one mole of marbles.

A mole of baseballs would just about fit perfectly into a ball bag the size of the earth.

A mole of marshmallows would cover the US to a depth of 6500 miles! (volume of marshmallow is 1 in^3)

If an Avogadro number of pennies were distributed evenly among the 6.9×10^9 people on earth, each person would have enough money to spend a million dollars every hour-day and night– and still have almost half of it unspent at death.

Molar Displays

One mole of various substances:

- **Water (18 mL)**
- **Methanol (40.4 mL)**
- **Copper (63.6 g)**
- **Sodium chloride (58.5 g)**
- **Carbon (12 g)**
- **Sulfur (32.1 g)**
- **Buy a set of mole element bars from Flinn or Education Innovations**

Multiples of a Mole with Sodium Chloride (NaCl

- **0.10 mol– 5.85 g**
- **0.50 mol– 29.2 g**
- **1.00 mol– 58.5 g**
- **2.00 mol– 117 g**
- **5.00 mol– 292 g**
- **10.0 mol– 585 g**

ROLL-A-MOLE ACTIVITY

From Caroline L. Ayers

Given the following information: There are 40 nickels in a roll.
There are 40 quarters in a roll.

Answer these questions. Show Set Up!

_____ nickels = 1 roll of nickels = $ _____

_____ quarters = 1 roll of quarters = $ _____

_____ atoms of S = 1 mole S = _____g S

_____ atoms of Br = 1 mole Br = _____g Br

1. What is the value of a roll of nickels?
2. What is the value of a roll of quarters?

1'. What is the mass of a mole of sulfur?
2'. What is the mass of a mole of bromine?

Use only the above equalities to answer the following questions:

3. How many nickels are in 3 rolls of nickels?

3'. How many atoms of S are in 3.00 mol S?

4. What is the value of 3 rolls of nickels

4'. What is the mass of 3.00 mol S?

5. How many rolls of quarters in $500?

5'. How many moles are in 53.8 g Br?

6. How many nickels are in $500 of nickels?

6'. How many atoms are in 1.5 g of Br?

Answers: 1. $2 2. $10 3. 120 4. $6 5. 50 6. 10,000
1'. 32.1g 2'. 79.9 g 3'. 1.81×10^{24} atoms S 4'. 93.6 g S
5'. 0.673 mol Br 6'. 1.1×10^{22} atoms Br

Wolfram Alpha: Check out this search engine for solving problems. http://teachingcollegemath.com/?cat=14 This site explains how Alpha will solve problems and show the best way to solve them. Students will adapt to using this faster than teachers.

Quizlet is a lightning fast way to memorize vocabulary lists. It's like flashcards, but much more fun and interactive. Check out this free service at **quizlet.com.** You can form groups for your class and post to face-book or my space. It is a very easy program to learn.

TAKS MNEMONICS

Taxonomy
Keep pond clean or fish get sick
King Phillip Could Only Find Green Socks
Kingdom Phylum Class Order Family Genus Species

5 Kingdoms
My puppy feels pretty awesome
Monera, protista, fungi, plant, animal

Heart Smart
"a" from "arteries" ="away from the heart"
"in" from "veins" = "into the heart"

DNA
At **T**he **G**irl's **C**lub **= AT + GC**

Adenine pairs with **T**hymine
Guanine pairs with **C**ytosine

ENERGY THROUGH A FOOD WEB
Some people can have crazy outrageous dreams.
Sun producers consumers herbivores carnivores omnivores decomposers

Bonding
"HONC"
H requires 1 more electron in its outer shell to become stable.
O requires 2.
N requires 3.
C requires 4.

BrINClHOF (pronounced brinklehoff)
Diatomic elements: *Bromine, Nitrogen, Chlorine, Hydrogen, Oxygen, and Fluorine.*

Red **M**artians **I**nvade **V**enus **U**sing **X-ray G**uns.
This device is used to remember the Electromagnetic Spectrum from lowest to highest energy.
Radio, Micro, Infrared, Visible, Ultraviolet, X-ray, Gamma.

APE MAN
***A**tomic number=**P**rotons=**E**lectrons **M**ass number=**A**tomic number + **N**eutrons*

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- Other _____

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